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Timed Insemination vs. Modified Estrus Detection in Beef Heifers

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Summary with Implications

The objective of this study was to compare a modified estrus detection and fixed time AI vs. no estrus detection and fixed time AI on subsequent pregnancy rates. Yearling heifers were estrus synchronized and AI at 72 ± 2 h after prostaglandin injection. In one group estrus was not detected and all heifers received gonadotropin releasing hormone at the fixed-time AI; in the other group estrus was detected at 58 ± 2 and 70 ± 2 h after prostaglandin and inseminated in the following order at 72 ± 2 h: heifers in estrus at 58 h, heifers in estrus at 70 h, and heifers not appearing in estrus at either observation. Similar AI conception and final pregnancy rates were achieved without the added labor of estrus detection.

Introduction

Artificial insemination (AI) allows producers to utilize superior genetics for less cost than purchasing a herd sire of similar quality. Using AI can decrease the chance for dystocia by using high accuracy calving ease sires. Additionally, estrus synchronization can shorten the calving season, increase calf uniformity (2010 Nebraska Beef Report, pp. 13–15), and facilitate the use of AI.

Estrus synchronization and AI require planning and additional time and labor. Fixed-time AI (**FTAI**) protocols eliminate estrus detection and reduce the number of times cattle are handled, but may result in lower conception rates than protocols involving estrus detection (2016 Nebraska Beef Report, pp. 17–18). Melengestrol acetate (**MGA**) is an alternative progestin commonly used to synchronize estrus in beef heifers and has proven to be as effective as controlled internal drug release (**CIDR**) device in fixed-time AI protocols (2014 Nebraska Beef Report, pp. 8–10). The objective of this study was to compare pregnancy rates using modified estrus detection and FTAI vs. no estrus detection and FTAI utilizing a MGA-prostaglandin F2α (**PG**) synchronization protocol.

Procedure

Yearling, Angus-based crossbred heifers (n = 971, 761 ± 31 lb) were managed in 3 groups at the Kelly Ranch near Sutherland, NE. During the development period, heifers were fed to achieve 60% mature BW at breeding.

Heifers in Group 1 (n = 297) were managed in 3 drylot pens and offered a diet consisting of wet distillers grains (**WDG**), grass hay, corn silage (**CS**), and a pellet to balance for minerals. Heifers in Group 2 (n = 317) grazed dormant meadow and were offered supplement containing WDG, CS, and a balancer pellet. In early February, heifers in Group 2 were moved to 2 drylot pens and offered a diet containing WDG, grass hay, CS, and balancer pellet. Heifers in Group 3 (n = 357) were managed in 5 drylot pens and offered a diet comprised of WDG, mixed hay (50, 25, and 25% alfalfa, grass, and millet hay, respectively), CS, and liquid finisher supplement.

All heifers were synchronized using a MGA-PG protocol. From d 1 through d 14 each heifer was offered 0.5 mg/d MGA (Zoetis, Florham Park, NJ) pellets included in their diet. On d 33, heifers received a

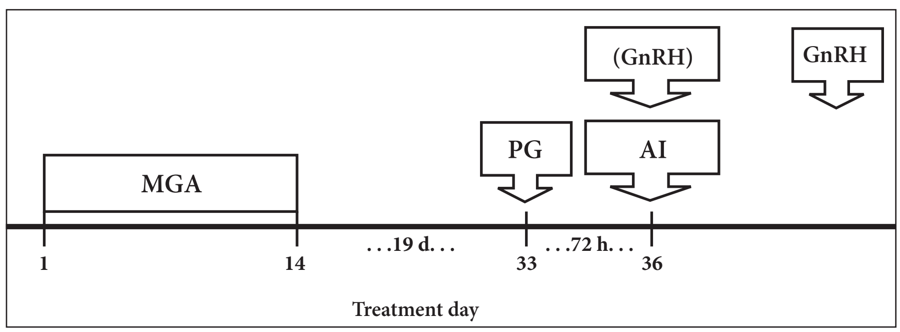

Figure 1. Melengestrol acetate-prostaglandin $F_{2\alpha}$ (MGA-PG) estrus synchronization and fixed time AI protocol

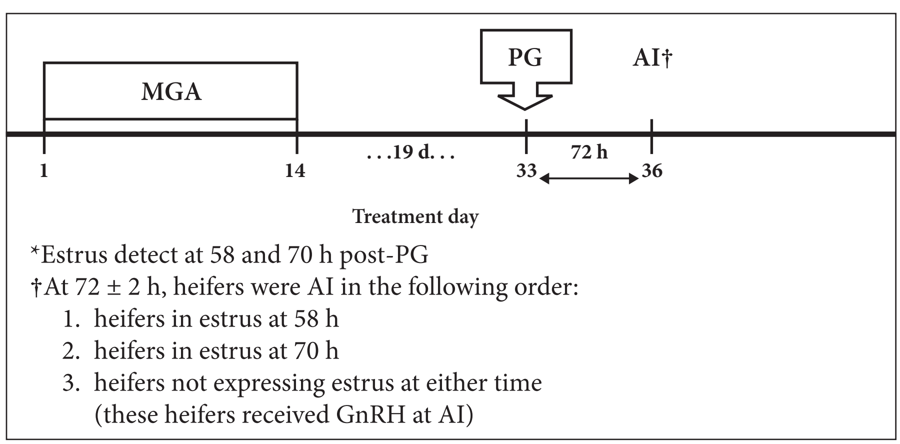

Figure 2. Modified melengestrol acetate-prostaglandin $F_{2\alpha}$ (MGA-PG) estrus synchronization and AI protocol

Table 1. Comparison of FTAI[1] or MTAI[2] protocols on heifer performance

Item	FTAI	MTAI	SEM	*P*-Value
n	486	485		
Pre-breeding BW, lb	763	758	31	0.87
Pregnancy test BW, lb	807	814	15	0.27
ADG[3], lb	0.88	0.66	0.11	0.59
Percent mature BW[4], %	62	63	5	0.86
AI pregnancy rate, %	62	62	5	0.49
Final pregnancy rate, %	96	97	3	0.98

[1] Synchronized using melengestrol acetate-prostaglandin F_{2a} (MGA-PG) protocol. Approximately 72 ± 2 h after PG heifers received GnRH and AI.
[2] Synchronized using MGA-PG protocol. Heifers were detected for estrus at 58 ± 2 and 70 ± 2 h post PG. At 72 ± 2 h after PG, heifers were AI in the following order: heifers in estrus 58 h post-PG, heifers in estrus 70 h post-PG, and heifers not expressing estrus, which received GnRH at AI.
[3]ADG from pre-breeding to pregnancy diagnosis.
[4] Based on 1,220 lb mature BW.

Table 2. Effect of estrus status (patch score[1]) at AI on heifer pregnancy rates in heifers on a FTAI[2] or MTAI[3] protocol

	FTAI				MTAI					
Patch score	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*	SEM	*P*-Value
n	44	144	283	15	44	110	326	5		
AI pregnancy rate, %	42[b]	48[b]	71[a]	40[b]	52[b]	53[b]	66[a]	55[b]	8	< 0.05
Final pregnancy rate, %	96	96	97	86	93	90	95	99	3	0.97

[1] Reflected the percentage of rub-off coating removed from the estrus detection aid, or patch: patch score 1 = not rubbed, 2 = ≤ 50% rubbed, 3 = ≥ 50% rubbed, and 4 = missing.
[2] Synchronized using melengestrol acetate-prostaglandin F_{2a} (MGA-PG) protocol. Approximately 72 ± 2 h after PG heifers received GnRH and AI.
[3] Synchronized using MGA-PG protocol. Heifers were detected for estrus at 58 ± 2 and 70 ± 2 h post PG. At 72 ± 2 h after PG, heifers were AI in the following order: heifers in estrus 58 h post-PG, heifers in estrus 70 h post-PG, and heifers not expressing estrus, which received GnRH at AI.
[a,b] Means in a row with differing superscripts differ (*P* < 0.05).

5 mL i.m. PG (Lutalyse, Zoetis, Florham Park, NJ) injection. At PG injection, estrus detection aids, or patches, were applied (Estrotect, Rockway Inc, Spring Valley, WI). At AI, a patch score was recorded for each heifer to indicate estrus status. The score reflected the percentage of rub-off coating removed from the patch. A patch score 1 meant a patch had no rub-off coating removed, a score of 2 described a patch with < 50% of the coating removed, a patch score 3 represented a patch with ≥ 50% of the coating removed, and a patch score of 4 reflected a missing patch. Heifers receiving a patch score of 3 were considered to have expressed estrus.

At 72 ± 2 h after PG, all FTAI heifers (Figure 1) received 2 mL GnRH (Fertagyl, Intervet/Merck Animal Health, Madison, NJ) i.m. injection and were AI. Heifers in the modified-time AI (**MTAI**, Figure 2) treatment were detected for estrus at 58 ± 2 and 70 ± 2 h after PG. Heifers expressing estrus were penned separately. Approximately 72 ± 2 h after PG, MTAI heifers were AI in the following order: heifers in estrus at 58 h post-PG, heifers in estrus at 70 h post-PG, and heifers not expressing estrus at either observation. Heifers not expressing estrus in at either detection time (58 and 70 h post-PG) received GnRH at AI. Thirteen days following AI, bulls were placed with heifers at a bull to heifer ratio of 1:50 for a 42 d breeding season. A minimum of 51 d after AI, BW was measured and pregnancy was detected via transrectal ultrasonography (Aloka, Hitachi Aloka Medical America Inc., Wallingford, CT). Heifers not pregnant by AI were diagnosed for pregnancy again 45 d following bull removal.

Statistical Analysis

All data were analyzed using the GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C.) accounting for group, pen, treatment, and treatment × group interaction. Origin, group, and AI technician were included as random variables. Pregnancy rate was analyzed using an odds ratio. Least square means and SE of the proportion of pregnant heifers by treatment were obtained using the ILINK function.

Results

Pre-breeding BW was similar (*P* = 0.48) between FTAI and MTAI heifers (763 and 758 ± 31 lb, respectively; Table 1). Furthermore, BW was similar (*P* = 0.26) at first pregnancy diagnosis (807 and 814 ± 15 lb; FTAI and MTAI, respectively). Heifers from both groups reached a similar (*P* = 0.86) percentage mature BW (62 ± 5%, based on 1,220 lb mature BW) prior to breeding. The AI conception rate was also similar (62 ± 5%, *P* = 0.49) for both treatments.

Conception rates by patch score are shown in Table 2. Heifers exhibiting an activated patch (score 3) had greater (*P* < 0.01; 71 and 66 ± 5% for FTAI and MTAI, respectively) AI conception rate in both FTAI and MTAI treatments vs. 47 and 53 ± 9 % AI conception rates in non-estrus heifers (score 1, 2, and 4) for FTAI and MTAI, respectively.

At first estrus detection (58 ± 2 h) 132 heifers exhibited a patch score of 3 (66 ± 5% conception rate), at second estrus detection (70 ± 2 h) 156 heifers exhibited a patch score 3 (66 ± 5% conception rate), and at AI, 38 additional heifers exhibited a patch score 3 for MTAI protocol (68 ± 5% conception rate). Estrus activity at AI did not influence final pregnancy rates (96 and 97 ± 3% for FTAI vs. MTAI, respectively; *P* = 0.97).

Conclusion

Reproductive technologies such as estrus synchronization and AI have limited adoption in the beef industry, partially due to added labor. Protocols that limit labor and cattle processing have a greater potential of being adopted. The present study provided a synchronization and AI protocol that limits cattle handling and eliminates estrus detection without compromising conception rates.

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